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NASA/SP—1999-7011/SUPPL488
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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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Typical Report Citation and Abstract

1. 19970001126 NASA Langley Research Center, Hampton, VA USA
2. Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Platform Shapes
3. Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA.
4. Mar. 1996; 130p; In English
5. Contract(s)/Grant(s): RTOP 505-68-70-04
6. Report Nos(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
7. To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
8. Author.
9. *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

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9. Subject Terms

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 488)

APRIL 5, 1999

51
LIFE SCIENCES (GENERAL)

19990019801 Colorado Univ., BioServe Space Technologies, Boulder, CO USA

A Review of Plant Experiments Supported by the Astro/Plant Generic Bioprocessing Apparatus on MSL-1

Heyenga, A. G., Colorado Univ., USA; Stodieck, Louis S., Colorado Univ., USA; Hoehn, A., Colorado Univ., USA; Microgravity Science Laboratory (MSL-1); November 1998, pp. 2-7; In English; See also 19990019800; No Copyright; Avail: CASI: A02, Hardcopy; A03, Microfiche

The utilization of plant-based materials in modern human society is extensive and of considerable commercial value including the production of food, pharmaceutical, lumber, and paper products. The advent of space flight research and the means to cultivate plants in the near absence of gravity have provided a unique opportunity to expand our understanding of plant physiology, metabolism, and genetics and to develop new approaches to further utilize this resource. An area of specific commercial interest encompasses the prospect that microgravity may be used to alter and help elucidate the control mechanisms of certain plant metabolic pathways enabling the further genetic engineering and cultivation of plants with desired traits on Earth. Particular attention is being directed towards the study of the cell structural compound lignin. A potential decrease in the production of such a compound could result in a corresponding increase in the production of metabolically related compounds including lignans and neolignans that are of significant medicinal value. An alteration in metabolic flux may equally extend to an enhancement in the production of compounds arising from the valuable alkaloid and terpene pathways. Additional areas in which the absence of gravity may influence plant metabolism include the production and distribution of plant growth control factors such as auxins and in the production of ligand molecules involved in the recognition system of plant symbiotic associations with microorganisms. The latter process is of significant value to agriculture in such areas as nitrogen fixation. The implementation of the MSL-1 plant study conducted on the Shuttle mission STS-94 was directed towards establishing an initial experimental baseline in plant response and applying investigative techniques that include the use of radioisotopes and molecular markers. A number of plant species were cultivated for 16 days in the Astro/Plant Generic Bioprocessing Apparatus (Astro/PGBA) under defined environmental conditions. The principle areas of investigation involved an examination of (a) lignin and vinca alkaloid metabolism, (b) the response of an auxin inducible GH3 gene, and (c) the interactive association of wheat with Rhizobium bacteria.

Author

Radioactive Isotopes; Plants (Botany); Nitrogenation; Pharmacology; Genetic Engineering; Vegetation Growth; Microgravity; Genetics

19990020846 Toronto Univ., Dept. of Geology, Ontario Canada

Bacterial Mineral Precipitation and the Making of Microfossils

Ferris, F. G., Toronto Univ., Canada; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 12-13; In English; See also 19990020835; No Copyright; Avail: CASI: A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

An important prerequisite for the precipitation of minerals from aqueous solutions, even where bacteria are involved, is that a moderate degree of oversaturation must be achieved. This requirement is imposed thermodynamically by an activation energy barrier that constrains the spontaneous formation of insoluble precipitates from solution. Bacteria intervene in mineral precipitation reactions in two ways, either directly as catalysts of aqueous geochemical reactions or indirectly as chemically reactive solids. In the first case, bacterial metabolic activity is often significant and can trigger changes in solution chemistry that lead to oversaturation (e.g., through the production of reactive ligands like sulfide). This alone can induce mineral formation by lowering the activation energy barrier for homogeneous (precipitation in solution) and heterogeneous (surface precipitation on foreign solids) nucleation reactions. The second case relates to the presence of reactive amphoteric sites on bacterial cells that facilitate sorption

of dissolved mineral-forming elements, and foster heterogeneous surface precipitation reactions. Thus, minerals precipitated directly from solution as a result of bacterial metabolic activity can form on the inside, outside, or even some distance away from cells. Indirect chemical precipitation as a consequence of changing geochemical conditions is also possible and is accompanied by passive epicellular nucleation and crystal growth on the outside of living or dead bacterial cells; this is the most likely pathway leading toward preservation of structurally intact microfossils. In natural systems, however, direct and indirect bacterial mineral precipitation reactions may occur at the same time and are difficult to recognize as entirely separate processes. When bacteria are metabolically involved in mineral formation, biogenicity can sometimes be inferred from chemical (e.g., stable isotope) or mineralogical (e.g., magnetite produced by magnetotactic bacteria) data. On the other hand, microscopic techniques are useful in the assessment of cell-surface-mediated mineral precipitation providing that diligence is exercised to unequivocally establish the composite nature (i.e., mineralogical and bacterial) of the specimen.

Author

Bacteria; Chemical Reactions; Geochemistry; Microorganisms; Mineralogy; Fossils; Paleobiology

19990020849 Granada Univ., Facultad de Ciencias, Spain

Biomimetic (sic) Abiotic Carbonates: New Geochemical Markers for Primitive Environments

Garcia-Ruiz, J. M., Granada Univ., Spain. Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 16-17. In English. See also 19990020835. No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

The unambiguous detection of ancient life is a crucial necessity in assessing the timing of life on Earth. Today, the strategy to reveal features of past life forms is also of utmost importance in seeking out living beings on other planets. Among other very few biomarkers used today (stromatolite structures, antigenic minerals, biological degradation compounds, and isotopic analysis), morphological recognition of living forms still plays a critical role in Precambrian micropaleontological studies. The underlying principle supporting life detection using morphological and textural tools derived from the old idea that inorganic precipitates are unable to produce neither shapes displaying certain symmetry groups nor certain bizarre textural arrangements. In this frame of mind, there is a substantial morphological difference between the inanimate and the animate worlds: it was thought that certain complex shapes with noncrystallographic symmetry were characteristic of life and would be impossible to obtain by inorganic precipitation. The most recent and conspicuous application of this "law" is the fossillike microstructures found in ALH-84001.

Author

Exobiology; Carbonates; SNC Meteorites; Extraterrestrial Life; Biogeochemistry

19990020856 Harvard Univ., Botanical Museum, Cambridge, MA USA

The Signature of Life: Is it Legible?

Knoll, A. H., Harvard Univ., USA. Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, 2p. In English. See also 19990020835. No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Everyday experience suggests that the gulf between biology and the physical world is conspicuous. This impression arises, however, because the biology most familiar to us is largely that of organisms found on distal branches of the tree of life. The difficulty in distinguishing biogenic from abiogenic forms lies at the other end of the tree; life arose as the self-perpetuating product of physical processes, and it is likely that the characteristics of Earth's earliest organisms - their size, shape, molecular composition, and catalytic properties - bore a close resemblance to products of the physical processes that gave rise to life.

Author

Chemical Composition; Organisms; Mars Environment; Mars Surface; Extraterrestrial Life; Microorganisms

19990020857 Institute of Space Research, Moscow, USSR

Martian Biogenic Activity: Looking for Viruses and DNA Traces Instead of Extant Bacteria Traces

Ksanfomality, L. V., Institute of Space Research, USSR. Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 26. In English. See also 19990020835. No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

A current program of investigations of organic components in ALH 84001 meteorite findings includes a study of the polyaromatic hydrocarbons traces, C-isotopic analysis, a search for amino-acid traces, O-isotopic analysis, etc. All of these studies are based on a hypothesis about a presence of martian prehistoric primitive life traces in the SNC meteorite from Mars. The hypothesis is based on the contemporary existing notions of the origin of life that originated in natural fashion, through numberless chemical reactions, which were highly probable under the conditions of young Earth. There are a number of proofs that these same conditions occurred early in martian history, which means life could have originated on Mars as well. The only known terrestrial life

form is amino nucleic-acid life that uses nucleic acids as an information system. Primitive life forms include both microbes and viruses. It is known that viruses are able to withstand much more severe conditions than bacteria. Their inactive forms may survive for a long time until favorable conditions occur again. Thus, it could make sense to look for viruses or even DNA traces both in the body of the ALH84001 meteorite and on Mars in future space missions.
Author
Amino Acids; Deoxyribonucleic Acid; Mars (Planet); SNC Meteorites; Viruses; Extraterrestrial Life; Exobiology; Planetary Environments

19990020862 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Principal Component Analysis for Biosignature Detection in Extraterrestrial Samples
McDonald, G. D., Jet Propulsion Lab., California Inst. of Tech., USA; Storrie-Lombardi, M. C., Jet Propulsion Lab., California Inst. of Tech., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 30-31; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Analysis of extraterrestrial samples for organic signatures of past or present life presents several problems. Chief among these is distinguishing bonafide extraterrestrial organic material from terrestrial contamination, either carried on a spacecraft or present in the terrestrial environment to which the sample is exposed. A related problem is separating biologically derived molecules from those produced by abiotic syntheses in the interstellar medium, on meteorite parent bodies, or in planetary atmospheres and oceans.
Author
Meteorites; Organic Materials; Principal Components Analysis; Signatures; SNC Meteorites; Extraterrestrial Life; Exobiology

19990020867 Stanford Univ., Dept. of Geological and Environmental Sciences, Stanford, CA USA
Recognizing Life and its Evolution Through Biomarkers
Moldowan, J. M., Stanford Univ., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 37-38; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Biomarkers are molecular fossils found in sedimentary rocks and petroleum. Like fossils, they are recognized as remnants of enzyme-mediated biosynthesis dictated by genetic code. They cannot be confused with abiogenic molecules, because they are produced in abundances that far exceed their relative chemical stabilities.
Author
Biosynthesis; Fossils; Paleobiology; Microorganisms

19990020868 NASA Johnson Space Center, Houston, TX USA
Possible Microfossils (Warrawoona Group, Towers Formation, Australia, approximately 3.3 - 3.5 Ga)
Morris, P. A., Houston Univ., USA; Wentworth, S. J., Lockheed Martin Corp., USA; Allen, C. C., Lockheed Martin Corp., USA; McKay, D. S., NASA Johnson Space Center, USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 38-39; In English; See also 19990020835
Contract(s)/Grant(s): NAG9-980; NAG9-867; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Early in the twentieth century there were reports of Archean stromatolite-like structures that were similar to organic rich stromatolites from the base of the Cambrian (600 m.y.). It was not until the latter half of this century that fossilized Archean-age (3.9-2.5 Ga) life forms were found in the Fig Tree Formation of South Africa and the Towers Formation of Australia. Some of the ancient stromatolites contained streaks and clots of kerogen, pyrite grains, remnants of microbial cells, and filaments that represented various stages of preservation, while others appeared to lack fossils. A set of physical criteria was established for evaluating the biogenicity of these Archean discoveries: (1) rocks of unquestionable Archean age; (2) microfossils indigenous to Archean sediments; and (3) microfossils occurring in clasts that are syngenetic with deposition of the sedimentary unit. In the case of bedded cherts, the fossils should predate the cherts; (4) the microfossils are biogenic; and (5) replicate sampling of the fossil-iferous outcrop firmly demonstrates the provenance of these microfossils. Sample 002 from the Precambrian Paleobiology Research Group (PPRG) was examined. This stromatolitic carbonaceous chert contains microbial remains that meet the established criteria [10]. Using a scanning electron microscope (SEM), we have analyzed the morphologies and chemistry of these possible microbial remains.
Author
Microorganisms; Paleobiology; Precambrian Period; Rocks

19990026871 Lockheed Martin Corp., Houston, TX USA

Reconnaissance Sampling of Airborne Molecular Organic Contamination in the Meteorite Curation Facility of Johnson Space Center

Schilling, E. A.; Lockheed Martin Corp., USA; Schneider, M. N.; Lockheed Martin Corp., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 40-42; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Determining the extent of contamination of meteorites by terrestrial organic compounds has become a question of critical importance in the last several years. Contamination issues have been considered in the past and recognized as important, resulting in a good deal of study. However, more thoroughly understanding organic contamination issues is especially pressing when considering possible evidence of previous life on Mars and in future Mars sample-return missions.

Author

Contamination; Extraterrestrial Life; Mars (Planet); Mars Sample Return Missions; Meteorites; Organic Compounds; Exobiology; SNC Meteorites

19990026879 NASA Johnson Space Center, Houston, TX USA

Mineralization of Bacteria in Terrestrial Basaltic Rocks: Comparison With Possible Biogenic Features in Martian Meteorite Allan Hills 84001

Thomas-Keprta, K. L.; Lockheed Martin Corp., USA; McKay, D. S.; NASA Johnson Space Center, USA; Wentworth, S. J.; Lockheed Martin Corp., USA; Stevens, T. O.; Battelle Pacific Northwest Labs., USA; Taunton, A. E.; Arkansas Univ., USA; Allen, C. C.; Lockheed Martin Corp., USA; Gibson, E. K., Jr.; NASA Johnson Space Center, USA; Romanek, C. S.; Savannah River Ecology Lab., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 53-54; In English; See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

The identification of biogenic features altered by diagenesis or mineralization is important in determining whether specific features in terrestrial rocks and in meteorites may have a biogenic origin. Unfortunately, few studies have addressed the formation of biogenic features in igneous rocks, which may be important to these phenomena, including the controversy over possible biogenic features in basaltic martian meteorite ALH84001. to explore the presence of biogenic features in igneous rocks, we examined microcosms growing in basaltic small-scale experimental growth chambers or microcosms. Microbial communities were harvested from aquifers of the Columbia River Basalt (CRB) group and grown in a microcosm containing unweathered basalt chips and groundwater (technique described in. These microcosms simulated natural growth conditions in the deep subsurface of the CRB, which should be a good terrestrial analog for any putative martian subsurface ecosystem that may have once included ALH84001. Here we present new size measurements and photomicrographs comparing the putative martian fossils to biogenic material in the CRB microcosms. The range of size and shapes of the biogenic features on the CRB microcosm chips overlaps with and is similar to those on ALH84001 chips. Although this present work does not provide evidence for the biogenicity of ALH84001 features, we believe that, based on criteria of size, shape, and general morphology, a biogenic interpretation for the ALH84001 features remains plausible.

Author

Bacteria; Basalt; Fossils; Geochemistry; Igneous Rocks; Mars (Planet); Microorganisms; Sediments; SNC Meteorites

19990026880 Lunar and Planetary Inst., Houston, TX USA

Ancient Martian Life in Allan Hills 84001? Status and Current Controversies

Treiman, A. H.; Lunar and Planetary Inst., USA; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 54-56; In English; See also [illegible]; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

Four lines of evidence were taken to suggest that ALH84001 contained traces of ancient martian life preserved in its carbonate mineral masses: [1] abundance of organic compounds Polycyclic aromatic hydrocarbons (PAHs), [2] disequilibrium mineral assemblages, [3] morphology of submicrometer magnetite crystals, and [4] presence of objects comparable in size and shape to bacteria. This evidence is predicated on the carbonate globules having formed at temperatures conducive to life. Here, I review evidence on carbonate formation temperature, martian origin of organic compounds, and bacteria-shaped objects.

Author

Mars (Planet); Mineral Deposits; Exobiology; Extraterrestrial Life; Polycyclic Aromatic Hydrocarbons; Carbonates; Temperature; Magnetite; Bacteria

19990020883 NASA Johnson Space Center, Houston, TX USA

Terrestrial Biomarkers for Early Life on Earth as Analogs for Possible Martian Life Forms: Examples of Minerally Replaced Bacteria and Biofilms From the 3.5 - 3.3-Ga Barberton Greenstone Belt, South Africa

Westall, F., NASA Johnson Space Center, USA; McKay, D. S., NASA Johnson Space Center, USA; Gibson, E. K., NASA Johnson Space Center, USA; deWit, M. J., Cape Town Univ., South Africa; Dann, J., Cape Town Univ., South Africa; Gemeke, D., Cape Town Univ., South Africa; deRonde, C. E. J., Institute of Geological and Nuclear Sciences Ltd., New Zealand; Workshop on the Issue Martian Meteorites: Where do we Stand and Where are we Going?; 1998, pp. 61-62; In English. See also 19990020835; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche; Abstract Only; Abstract Only

The search for extraterrestrial life and especially martian life hinges on a variety of methods used to identify vestiges of what we could recognize as life, including chemical signatures, morphological fossils, and biogenic precipitates. Although the possibility of extant life on Mars (subsurface) is being considered, most exploration efforts may be directed toward the search for fossil life. Geomorphological evidence points to a warmer and wetter Mars early on in its history, a scenario that encourages comparison with the early Earth. For this reason, study of the early terrestrial life forms and environment in which they lived may provide clues as to how to search for extinct martian life. As a contribution to the early Archean database of terrestrial microfossils, we present new data on morphological fossils from the 3.5-3.3-Ga Barberton greenstone belt (BGB), South Africa. This study underlines the variety of fossil types already present in some of the oldest, best-preserved terrestrial sediments, ranging from mineraily replaced bacteria and bacteria molds of various morphologies (coccoid, coccobacillus, bacillus) to mineraily replaced biofilm. Biofilm or extracellular polymeric substance (EPS) is produced by bacteria and appears to be more readily fossilisable than bacteria themselves. The BGB fossils occur in shallow water to subaerial sediments interbedded with volcanic lavas, the whole being deposited on oceanic crust. Penecontemporaneous silicification of sediments and volcanics resulted in the cherrification of the rocks, which were later subjected to low-grade metamorphism (lower greenschist).

Author

Bacteria; Extraterrestrial Life; Fossils; Lava; Structural Properties (Geology); Biogeochemistry; Colonies; Morphology

19990021030 San Diego Univ., Biology Dept., San Diego, CA USA

Investigations of the Effects of Altered Vestibular System Function on Hindlimb Anti-Gravity Muscles

Lowery, Mary Sue, San Diego Univ., USA; Oct. 1998; 3p; In English. See also 19990021025; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Exposure to different gravitational environments, both the microgravity of spaceflight and the hypergravity of centrifugation, result in altered vestibulo-spinal function which can be reversed by reacclimation to earth gravity (2). Control of orientation, posture, and locomotion are functions of the vestibular system which are altered by changes in gravitational environment. Not only is the vestibular system involved with coordination and proprioception, but the gravity sensing portion of the vestibular system also plays a major role in maintaining muscle tone through projections to spinal cord motoneurons that control anti-gravity muscles. I have been involved with investigations of several aspects of the link between vestibular inputs and muscle morphology and function during my work with Dr. Nancy Daunton this summer and the previous summer. We have prepared a manuscript for submission (4) to Aviation, Space, and Environmental Medicine based on work that I performed last summer in Dr. Daunton's lab. Techniques developed for that project will be utilized in subsequent experiments begun in the summer of 1998. I have been involved with the development of a pilot project to test the effects of vestibular galvanic stimulation (VGS) on anti-gravity muscles and in another project testing the effects of the ototoxic drug streptomycin on the otolith-spinal reflex and anti-gravity muscle morphology.

Author

Research; Vestibules; Gravitation; Muscular Tonus; Muscular Function; Aerospace Medicine; Detection

19990021053 Washington Univ., School of Fisheries, Seattle, WA USA

Ecological Support of Larval Fish During Multigenerational Studies on Space Station

Taub, Frieda B., Washington Univ., USA; Oct. 1998; 3p; In English. See also 19990021025; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Live, microscopic food is required by larval Zebrafish, Danio rerio, which are candidates for the Aquatic Habitat of the Space Station Biological Research Project (SSBRP). Zebrafish have proven to be convenient research animals, and their embryology and genetics are extensively documented. Their ability to mature at 3 months of age, and the transparent eggs which hatches in 2 days, are attractive attributes for space research. Among the goals of the SSBRP Aquatic Habitat is the ability to study three generations, with the objective of maintaining adults, their offspring, and the maintaining of these offspring through maturity and spawning. For Zebrafish, it is anticipated that sexually mature fish (P1) would be delivered to Space Station and spawned in space. The challenge would be it to provide appropriate microscopic foods for the offspring (F1), and 3 months later for the next genera-

tion (F2); if these were raised to maturity and bred, live foods would be required at approximately 6 months. In laboratories where Zebrafish are traditionally reared, the larval foods are the protozoan Paramecium micronultinucleatwn and later brine shrimp Artemia nauplii. Under normal laboratory conditions, the rearing of these foods are relatively easy, although time consuming because of the food organisms must be separated from their rearing medium which is discarded. A freshwater food chain that would ensur-e healthy on- orbit research animals is needed. ne food chain should (a) be reared in conditions that are compatible with the larval fish (water chemistry, pH, temperature and light), (b) assist in maintaining water quality (by removing ammonia, nitrate, phosphate, carbon dioxide, and bacteria) and (c) be convenient for the space crew (minimize handling and waste production).

Derived from text

Ecology; Fishes; Embryology; Spaceborne Experiments; Artemia; Food Chain; Fresh Water; Organisms

19990021125 Wellesley Coll., MA USA

Calcification and photosynthesis of the coral acropora cervicornis under calcium limited conditions

Rathfon, Megan, Wellesley Coll., USA; Brewer, Debbie, Arizona State Univ., USA; Summer Research Internships at Biosphere 2 Center, 1997; 19p; In English; See also 19990021122; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

Differing hypothesis about the function of calcification are based on an interesting dilemma. Is the purpose of calcification mainly a structural and protective one or does calcification serve other functions? Does photosynthesis increase carbonate ion activity and cause calcification or does calcification increase CO2 levels and stimulate photsynthesis? It is proposed that calcification in corals is not dependent upon photosynthesis but upon calcium levels in the water. Under normal ocean conditions, corals convert a certain percentage of energy to photosynthesis and respiration and another percentage to calcification. As corals become nutrient stressed, particularly calcium limited, the ratio of photosynthesis to calcification shifts towards calcification in order to generate protons. The protons generated during calcification may stimulate photosynthesis and aid in the uptake of nutrients and biocarbonates. The results of the calcification experiment show a trend towards increased calcification and decreased photosynthesis when the coral Acropora cervicornis is calcium limited, but the data are inconclusive and further research is needed.

Author

Calcification; Photosynthesis; Respiration; Hypotheses; Carbon Dioxide; Calcium

19990021265 Columbia Univ., New York, NY USA

Summer Research Internships at Biosphere 2 Center. *Progress Report*

1998; 266p; In English; See also 19990021266 through 19990021272

Contract(s)/Grant(s): NAG5-6294; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

Through the support of NASA's Mission to Planet Earth, Biosphere 2 Center hosted 10 research interns for a 10 week period during the summer of 1998. In addition, we were able to offer scholarships to 10 students for Columbia University summer field courses. Students participating in these programs were involved in numerous earth systems activities, collecting data in the field and conducting analyses in the laboratory. Students enrolled in the field program were expected to design independent research projects as part of their coursework. In addition to laboratory and field research, students participated in weekly research seminars by resident and visiting scientists. Field school students were involved in field trips exposing them to the geology and ecology of the region including Arizona Sonora Desert Museum, Mount Lemmon, Aravaipa Canyon and the Gulf of California. Interns participated in laboratory-based research. All students were expected to complete oral and written presentations of their work during the summer.

Author

Schools; Students; Research; Mission to Planet Earth; Geology; Ecology; Data Acquisition

19990021266 Columbia Univ., New York, NY USA

Effects of Elevated CO2 Concentration on Photosynthesis and Respiration of Populus Deltoides

Anderson, Angela M., Columbia Univ., USA; Summer Research Internships at Biosphere 2 Center; 1998; 9p; In English; See also 19990021265; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

To determine how increased atmospheric CO2 will affect the physiology of cottonwood trees, cuttings of the cloned Populus deltoides [cottonwood] were grown in open-top chambers containing ambient or elevated CO2 concentration. The control treatment was maintained at ambient Biosphere 2 atmospheric CO2 (c. 450 +/- 50 micro l/l), and elevated CO2 treatment was maintained at approximately double ambient Biosphere 2 atmospheric CO2 (c. 1000 +/- 50 micro l/l). The effects of elevated CO2 on leaf photosynthesis, and stomatal conductance were measured. The cottonwoods exposed to CO2 enrichment showed no significant indication of photosynthetic down-regulation. There was no significant difference in the maximum assimilation rate between the treatment and the control (P less than 0.24). The CO2 enriched treatment showed a decreased stomatal conductance of 15%

(P less than 0.03). The elevated CO2 concentrated atmosphere had an effect on the respiration rates of the plants; the compensation point of the treatment was on average 13% higher than the control (P less than 0.01).
Author
Carbon Dioxide Concentration; Photosynthesis; Respiration

19980021267 New Mexico State Univ., Las Cruces, NM USA
Water Use Efficiency of Cottonwood Trees Using Delta C 13 in the IAB at Biosphere 2
Francisco, Nanel Y., New Mexico State Univ., USA; Barton, Kate, Cornell Univ., USA; 1998; 11p; In English; See also 19980021265; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

C3 and C4 plants were used together to help determine the isotopic ratios and the water use efficiency of the cottonwood trees. White Japanese popping corn and Bermuda grass were used as C4 plants through the 4 week experiment. The C3 plants or cottonwood trees are all genetically identical for the purpose of eliminating any genetic variability. Overall the dC13 of the outside air is -8.30 ppm. The IAB showed a lower value of -12 ppm. The West Bay showed lower dC13 because of less circulation of air. Statistical analysis showed a significant difference between the West bay and the Big Bay. The cottonwood trees also showed 5.69 mmolCO2/mol H2O in water use efficiency. The IAB [CO2] was kept about 445 ppm for the 4 weeks.
Author
Water; Isotope Ratios; Statistical Analysis; Corn

19980021268 Harvard-Radcliffe Coll., Cambridge, MA USA
The Light Environment of the Intensive Agriculture Biome of Biosphere 2
German, Jennifer, Harvard-Radcliffe Coll., USA; Summer Research Internships at Biosphere 2 Center; 1998; 16p; In English; See also 19980021265; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This project focuses on the light environment of Biosphere 2's Intensive Agriculture Biome, or IAB. It uses data taken from seven light sensors placed within each of the three bays of the IAB and determines what the light environment looks like. This is shown using a 3D surface map. The project also determines the average percent of sunlight which reaches each individual sensor, each section of the IAB, each bay of the IAB, and the IAB as a whole. It then compares these values of the average percent of the daily sunlight which reaches the IAB through the spaceframe with data provided on the growth of the cottonwood trees in the IAB. The best correlations are found between these sets of data on the bay level, but there are not many. The greatest amount of good correlations are found between the sets of data on the section level, while no correlations are found between the sets of data on the individual sensor level.
Author
Environment Management; Biosphere; Agriculture

19980021270 Harvard Univ., Cambridge, MA USA
Effect of Calcium Carbonate Saturation State on the Rate of Coral Calcification
Joo, Jayne S., Harvard Univ., USA; 1998; 18p; In English; See also 19980021265; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Coral reefs hold tremendous economic and biological importance worldwide. The health and survival of these ecosystems are tightly linked to atmospheric CO2 levels because of the cycling of carbon between air and surface ocean waters. It is known that an increase in pCO2 decreases the pH of the ocean, thereby, also decreasing the carbonate concentration. In this experiment, we investigated the effect of calcium carbonate saturation state on calcification rate and zooxanthellar photosynthesis of the hermatypic coral Porites Compressa using the alkalinity anomaly technique and the automated Winkler titration method. Saturation state changes were obtained by manipulating the concentration of Ca(2+) or DIC. The results show a 27% increase in calcification rate when the saturation is increased from below normal seawater level (Omega = 2.71 to that of natural seawater values (Omega = 3.41). Beyond the saturation state of normal seawater, there is no further increase in calcification. Net photosynthesis remained relatively constant for the various treatments, only the low saturation state reached by decreasing the DIC concentration with additions of 0.200 N HCl revealed a significant increase in photosynthetic activity. These findings reinforce the results of past studies which have linked calcification with saturation state. This experiment provides further evidence that anthropogenic emissions of CO2 may pose a threat to coral growth.
Author
Calcium Carbonates; Saturation (Chemistry); Carbon Dioxide Concentration; Sea Water; Ecosystems; Calcification

19990021301 General Thermal, Inc., Chattanooga, TN USA

Stir-97 Sterilization and Decontamination of Matter with a one Atmospheric Glow Discharge: *Final Report, 1 Sep. 1997 - 31 Aug. 1998*

Glascock, Battle, General Thermal, Inc., USA; Aug. 31, 1998; 27p; In English

Contract(s)/Grant(s): F49620-97-C-0074

Report No.(s): AD-A358559; AFRL-SR-BL-TR-98-0855; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The investigation into the sterilization and decontamination of matter with one atmospheric glow discharge yielded many new direction for this unique technology. Our original direction for the project was to design and build a prototype atmospheric glow discharge system to allow for the treatment of various pathogenic microorganisms. The primary goals were to determine the minimum power density to required sterilization using various gas mixtures and media types. Various atmospheres and power settings were used to determine the feasibility of this systems use and its potential for field operations in a portable sterilization and decontamination system.

DTIC

Glow Discharges; Sterilization; Research; Decontamination

19990021533 NASA Goddard Space Flight Center, Greenbelt, MD USA

GCM Studies on the Interactions Between Photosynthesis and Climate at Diurnal to Decadal Time Scales

Collatz, G. James, NASA Goddard Space Flight Center, USA; Bounoua, Lahouari, NASA Goddard Space Flight Center, USA; Sellers, Piers, NASA Goddard Space Flight Center, USA; Los, Sietse, NASA Goddard Space Flight Center, USA; Randall, David, NASA Goddard Space Flight Center, USA; Berry, Joseph, NASA Goddard Space Flight Center, USA; Tucker, Compton J., NASA Goddard Space Flight Center, USA; 1998; 7p; In English; AGU Fall Meeting, 6-10 Dec. 1998, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Transpiration, a major component of total evaporation from vegetated surfaces, is an unavoidable consequence of photosynthetic carbon fixation. Because of limiting soil moisture and competition for solar radiation plants invest most of their fixed carbon into structural and hydraulic functions (roots and stems) and solar radiation absorption (leaves). These investments permit individuals to overshadow competitors and provide for transport of water from the soil to the leaves where photosynthesis and transpiration occur. Often low soil moisture or high evaporative demand limit the supply of water to leaves reducing photosynthesis and thus transpiration. The absorption of solar radiation for photosynthesis and dissipation of this energy via radiation, heat, mass and momentum fluxes represents the link between photosynthesis and climate. Recognition of these relationships has led to the development of hydro/energy balance models that are based on the physiological ecology of photosynthesis. We discuss an approach to study vegetation-climate interactions using photosynthesis-centric models embedded in a GCM. The rate at which a vegetated area transpires and photosynthesizes is determined by the physiological state of the vegetation, its amount and its type. The latter two are specified from global satellite data collected since 1982. Climate simulations have been carried out to study how this simulated climate system responds to changes in radiative forcing, physiological capacity, atmospheric CO2, vegetation type and variable vegetation cover observed from satellites during the 1980's. Results from these studies reveal significant feedbacks between the vegetation activity and climate. For example, vegetation cover and physiological activity increases cause the total latent heat flux and precipitation to increase while mean and maximum air temperatures decrease. The reverse occurs if cover or activity decreases. In general climate response of a particular region was dominated by local processes but we also find evidence that plausible climate-vegetation scenarios lead to changes in global atmospheric circulation and strong non-local influences in some cases. Author

Photosynthesis; Climate; Diurnal Variations; Carbon Dioxide Concentration; Atmospheric Circulation; Periodic Variations; Atmospheric Composition; Atmospheric General Circulation Models

19990024580 Texas Univ., Center for Extracellular Matrix Biology, Houston, TX USA

Distinct Secondary Structures of the Leucine-Rich Repeat Proteoglycans Decorin and Biglycan: Glycosylation-Dependent Conformational Stability

Krishnan, Priya, Texas Univ., USA; Hocking, Anne M., Texas Univ., USA; Scholtz, J. Martin, Texas A&M Univ., USA; Pace, C. Nick, Texas A&M Univ., USA; Holik, Kimberly K., Texas Univ., USA; McQuillan, David J., Texas Univ., USA; 1998; 25p; In English

Contract(s)/Grant(s): NCC9-36; NIH-AR-42826; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Biglycan and decorin, closely related small leucine-rich repeat proteoglycans, have been overexpressed in eukaryotic cells and two major glycoforms isolated under native conditions: a proteoglycan substituted with glycosaminoglycan chains; and a core protein form secreted devoid of glycosaminoglycans. A comparative biophysical study of these glycoforms has revealed that the overall secondary structures of biglycan and decorin are different. Far-UV Circular Dichroism (CD) spectroscopy of decorin and

biglycan proteoglycans indicates that, although they are predominantly Beta-sheet, biglycan has a significantly higher content of alpha-helical structure. Decorin proteoglycan and core protein are very similar, whereas the biglycan core protein exhibits closer similarity to the decorin glycoforms than to the biglycan proteoglycan form. However, enzymatic removal of the chondroitin sulfate chains from biglycan proteoglycan does not induce a shift to the core protein structure, suggesting that the final form is influenced by polysaccharide addition only during biosynthesis. Fluorescence emission spectroscopy demonstrated that the single tryptophan residue, which is at a conserved position at the C-terminal domain of both biglycan and decorin, is found in similar microenvironments. This indicates that at least in this specific domain, the different glycoforms do exhibit apparent conservation of structure. Exposure of decorin and biglycan to 10 M urea resulted in an increase in fluorescent intensity, which indicates that the emission from tryptophan in the native state is quenched. Comparison of urea-induced protein unfolding curves provided further evidence that decorin and biglycan assume different structures in solution. Decorin proteoglycan and core protein unfold in a manner similar to a classic two-state model, in which there is a steep transition to an unfolded state between 1-2 M urea. The biglycan core protein also shows a similar steep transition. However, biglycan proteoglycan shows a broad unfolding transition between 1-6 M urea, probably indicating the presence of stable unfolding intermediates.
Author
Biosynthesis; Eukaryotes; Polysaccharides; Proteins; Tryptophan; Urea; Leucine

19990024882 Texas Univ. Health Science Center, Graduate School of Biomedical Sciences, Houston, TX USA
Decorin is a Zn(2+) Metalloprotein
Yang, Vivian W.-C., Texas Univ. Health Science Center, USA; LaBrenz, Steven R., Texas A&M Univ., USA; Rosenberg, Lawrence C., Montefiore Hospital, USA; McQuillan, David, Texas A&M Univ., USA; Hocnek, Magnus, Texas A&M Univ., USA; 1998; 35p; In English
Contract(s)/Grant(s): NCC9-36; NIH-AR-42919; NIH-AR-42826; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Decorin is ubiquitously distributed in the extracellular matrix of mammals and a member of the proteoglycan family characterized by a core protein dominated by Leucine Rich Repeat motifs. We here demonstrate that decorin extracted from bovine tissues under denaturing conditions or produced in recombinant "native" form by cultured mammalian cells, has a high affinity for Zn(2+). Binding of Zn(2+) to decorin is demonstrated by Zn(2+) chelating chromatography and equilibrium dialyses. The Zn(2+) binding sites are localized to the N-terminal domain of the core protein that contains 4 Cys residues in the spacing reminiscent of a Zn finger. A recombinant 41 amino acid long peptide representing the N-terminal domain of decorin has full Zn(2+) binding activity and binds two Zn(2+) ions with an average K(D) of 3 x 10(exp -7) M. Biglycan, a proteoglycan that is structurally closely related to decorin contains a similar high affinity Zn(2+) binding segment, whereas the structurally more distantly related proteoglycans, epiphycan and osteoglycin, did not bind Zn(2+) with high affinity.
Author
Zinc; Proteins; Cells (Biology); Binding; Trace Elements; Collagens

19990024883 Baylor Coll. of Medicine, Houston, TX USA
Three-Dimensional Primary Hepatocyte Culture: Final Report
Yoffe, Boris, Baylor Coll. of Medicine, USA; Mar. 31, 1998; 4p; In English
Contract(s)/Grant(s): NCC9-36; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Our results demonstrated for the first time the feasibility of culturing PHH in microgravity bioreactor and exceeded the longest period obtained using other methods. Within the first week of culture, isolated hepatocytes started to form aggregates, which continuously increased in size (up to 1 cm) and macroscopically appeared as a multidimensional tissue-like assembly. to improve oxygenation and nutrition within the spheroids we performed experiments with the biodegradable nonwoven fiber-based polymers made from PolyGlycolic Acid (PGA). It has been shown that PGA scaffolds stimulate isolated cells to regenerate tissue with defined sizes and shapes and are currently being studied for various tissue-engineering applications. Our data demonstrated that culturing hepatocytes in the presence of PGA scaffolds resulted in more efficient cell assembly and formations of larger cell spheroids (up to 3 cm in length, see figure). The histology of cell aggregates cultured with PGA showed polymer fibers with attached hepatocytes. We initiated experiments to co-culture primary human hepatocytes with human microvascular endothelial cells in the bioreactor. The presence of endothelial cells in co-cultures were established by immunohistochemistry using anti-CD34 monoclonal Ab. Our preliminary data demonstrated that cultures of purified hepatocytes with human microvascular endothelial cells exhibited better growth and expressed higher levels of albumin MRNA for a longer period of time than cultures of ppfified, primary human hepatocytes cultured alone. We also evaluated microsomal deethylation activity of hepatocytes cultured in the

presence of endothelial cells. In summary, we have established liver cell culture, which mimicked the structure and function of the parent tissue.
Derived from text
Three Dimensional Models; Cells (Biology); Culture Techniques; Hepatitis; Feasibility Analysis; Liver; Histology

19990024978 Canterbury Univ., Dept. of Chemistry, Christchurch, New Zealand
The Preparation and Biological Activity of Lactam-Based, Non-Steroidal, Inhibitors of Human Type-I Steroid 5 alpha-Reductase
Abell, Andrew, D., Canterbury Univ., New Zealand; Phillips, Andrew J., Canterbury Univ., New Zealand; Budhia, Sangeeta, Canterbury Univ., New Zealand; McNulty, Ann M., Lilly Research Labs., USA; Neubauer, Blake L., Lilly Research Labs., USA; Australian Journal of Chemistry; 1998; ISSN 0004-9425; Volume 51, No. 5, pp. 389-396; In English; Copyright; Avail: Issuing Activity (Australian Journal of Chemistry, P.O.Box 1139 (150 Oxford St.), Collingwood, Victoria 3066, Australia); US Sales Only, Hardcopy, Microfiche
A Beckmann rearrangement of cis- and trans-fused 3,4,4a, 9,10, 10a-hexahydrophenanthren-1(2H)-one oximes has yielded three azepines. An in vitro assay of the azepines and (3aSR,9bSR)-6-methoxy-3- methyl-1,3,3a,4,5,9b-hexahydro-2H-benz[e]indol-2-one, prepared in four steps from naphthalene-1,6-diol, against human type-I steroid 5 alpha-reductase, revealed the tricyclic five-membered lactam to be a potent inhibitor (IC(sub 50) 733 nM).
Author
Activity (Biology); Lactates; Inhibitors; Assaying

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19990019766 Johns Hopkins Univ., Baltimore, MD USA
Structural Indices of Stress Fracture Susceptibility in Female Military Recruits *Final Report, 22 Sep. 1995 - 21 Sep 1998*
Beck, Thomas J.; Oct. 1998; 32p; In English
Report No.(s): AD-A356178; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Six hundred-ninety three female U.S. Marine Corps recruits were studied with anthropometry and dual energy x-ray absorptiometry (DXA) scans of the thigh and lower leg prior to recruit training. A total of 37 stress fractures were confirmed. Female data were combined with an earlier study of 626 male Marine recruits including 38 stress fracture cases. Bone structural geometry, cortical dimensions, thigh lean mass and muscle cross-sectional area were derived from DXA data. Measurements were compared within sex between pooled fracture cases and controls. Fracture cases in both sexes were less physically fit, and had smaller thigh muscles compared to controls. After correction for body size, section moduli (Z) and bone strength indices of the femur and tibia were smaller in fracture cases of both sexes but patterns differed. Compared to controls, female cases had thinner cortices and lower BMD. Male cases had narrower bones but similar cortical thickness and BMD. In both sexes, differences suggest poor skeletal adaptation to training in fracture cases due to inadequate prior conditioning. Lower stress fracture rates in African Americans compared to whites or Hispanics suggest stronger bones. Ethnic differences in bone and muscle indices of fracture susceptibility were studied within sex, using pooled data compared among ethnic groups. African Americans of both sexes showed longer leg bones, narrower pelves, larger tibia Z's, leaner thighs and larger thigh muscles than other groups, although initial fitness levels were similar (males) or worse (female's). Differences suggest genetically stronger skeletal mechanics in African Americans, compared to other groups. Results imply that stress fracture susceptibility and bone strength have both environmentally plastic and genetic components.
DTIC
Physical Fitness; Musculoskeletal System; X Ray Analysis; Anthropometry; Females; Ethnic Factors

19990021027 Arkansas Univ. for Medical Sciences, Dept. of Biopharmaceutical Sciences, Little Rock, AR USA
Virtual Reality Simulation of the Effects of Microgravity in Gastrointestinal Physiology
Compadre, Cesar M., Arkansas Univ. for Medical Sciences, USA; Oct. 1998; 4p; In English; See also 19990021025; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche
The ultimate goal of this research is to create an anatomically accurate three-dimensional (3D) simulation model of the effects of microgravity in gastrointestinal physiology and to explore the role that such changes may have in the pharmacokinetics of drugs given to the space crews for prevention or therapy. to accomplish this goal the specific aims of this research are: 1) To generate

a complete 3-D reconstructions of the human Gastrointestinal (GI) tract of the male and female Visible Humans. 2) to develop and implement time-dependent computer algorithms to simulate the GI motility using the above 3-D reconstruction.
Author
Virtual Reality; Simulation; Microgravity; Gastrointestinal System; Three Dimensional Models

19990021037 Bowling Green State Univ., School of HEPR - Kinesiology, OH USA
High Salt Diets, Bone Strength and Mineral Content of Mature Femur After Skeletal Unloading
Liang, Michael T. C., Bowling Green State Univ., USA; Oct. 1998; 3p; In English; See also 19990021025; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

It is known that high salt diets increase urinary calcium (CA) loss, but it is not known whether this effect weakens bone during space flight. The Bone Hormone Lab has studied the effect of high salt diets on Ca balance and whole body Ca in a space flight model (2,8). Neith r the strength nor mineral content of the femurs from these studies has been evaluated. The purpose of this study was to determine the effect of high salt diets (HiNa) and skeletal unloading on femoral bone strength and bone mineral content (BMC) in mature rats.
Author
Bone Mineral Content; Calcium; Minerals; Diets

19990021547 Brown Univ., Dept. of Pathology, Providence, RI USA
A Simplified Method for Tissue Engineering Skeletal Muscle Organoids in Vitro
Shansky, Janet, Brown Univ., USA; DelTatto, Michael, Brown Univ., USA; Chromiak, Joseph, Brown Univ., USA; Vandenburgh, Herman, Brown Univ., USA; 1996; 12p; In English
Contract(s)/Grant(s): NAS2-914; NAGw-4674
Report No.(s): NASA/CR-96-207789; NAS 1.26:207789; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Tissue-engineered three dimensional skeletal muscle organ-like structures have been formed in vitro from primary myoblasts by several different techniques. This report describes a simplified method for generating large numbers of muscle organoids from either primary embryonic avian or neonatal rodent myoblasts, which avoids the requirements for stretching and other mechanical stimulation.
CASI
Cells (Biology); Muscles; Tissues (Biology); Bioengineering; Culture Techniques

19990021562 NASA Langley Research Center, Hampton,VA USA
Aerospace Medicine and Biology: A Continuing Bibliography With Indexes, Supplement 486
Mar. 08, 1999; 36p; In English
Report No.(s): NASA/SP-1999-7011/SUPPL486; NAS 1.21:7011/SUPPL486; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In its subject coverage, Aerospace Medicine and Biology concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract.
Derived from text
Aerospace Medicine; Life Sciences; Human Behavior; Life Support Systems; Biotechnology; Exobiology; Bibliographies; Abstracts

19990021564 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France
Cervical Spinal Injury from Repeated Exposures to Sustained Acceleration *Les traumatismes de la colonne cervicale dus aux accelerations soutenues et repetitives*
February 1999; 104p; In English
Report No.(s): RTO-TR-4; AC/323(HFM-1/TP)9; ISBN 92-837-1013-4; Copyright Waived; Avail: CASI; A06, Hardcopy; A02, Microfiche

Published articles and reports on current studies by several nations on cervical neck injury, spinal degeneration and related topics are reviewed and analyzed in detail in the first 11 chapters. In Chapter 12 the biomechanics of the cervical spine and predic-

tive models on cervical injury from sustained G exposures are presented. Meta-analysis of 8 control-studies on the direct effects of sustained G exposures on cervical degeneration was performed and presented in Chapter 13. The statistical probability of a causal relationship was determined to be P less than 0.001. In Chapter 14, this information was summarized and further developed into a model on the relationship between aging and sustained G exposures on cervical spinal degeneration. In this model, cervical spinal degeneration occurs with repeated exposures to sustained G and with aging. However because of the continuous and pervasive effects of aging, the pilot population and non-G exposed population (controls) are predicted to have the same levels of cervical degeneration later in life. Recommendations presented in the last chapter include the need for more research on this topic, the development of standardized nomenclature and databases, and specific considerations on the prevention and treatment of acute neck injuries.

Author

Back Injuries; Spine; Spinal Cord; Acceleration Tolerance; Human Tolerances; Neck (Anatomy); Biodynamics; Acceleration Stresses (Physiology)

19990023260 Texas A&M Univ., Albert B. Alkek Inst. of Biosciences and Technology, Houston, TX USA

The Structure and Function of Non-Collagenous Bone Proteins: Final Report

Hook, Magnus, Texas A&M Univ., USA; November 1997; 4p; In English

Contract(s)/Grant(s): NCC9-36; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The long-term goal for this program is to determine the structural and functional relationships of bone proteins and proteins that interact with bone. This information will used to design useful pharmacological compounds that will have a beneficial effect in osteoporotic patients and in the osteoporotic-like effects experienced on long duration space missions. The first phase of this program, funded under a cooperative research agreement with NASA through the Texas Medical Center, aimed to develop powerful recombinant expression systems and purification methods for production of large amounts of target proteins. Proteins expressed in sufficient amount and purity would be characterized by a variety of structural methods, and made available for crystallization studies. In order to increase the likelihood of crystallization and subsequent high resolution solution of structures, we undertook to develop expression of normal and mutant forms of proteins by bacterial and mammalian cells. In addition to the main goals of this program, we would also be able to provide reagents for other related studies, including development of anti-fibrotic and anti-metastatic therapeutics.

Derived from text

Proteins; Bones; Cells (Biology); Crystallization; Collagens

19990024865 Baylor Coll. of Medicine, Houston, TX USA

Interaction of Vascular Smooth Muscle Cells Under Low Shear Stress: Final Report

Seidel, Charles L., Baylor Coll. of Medicine, USA; Jan. 01, 1998; 10p; In English

Contract(s)/Grant(s): NCC9-36; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The blood vessel wall consists of three cellular layers, an outer adventitial, a middle medial and an inner intimal layer. When the blood vessel forms in the embryo it begins as a tube composed of a single cell type called endothelial cells. Over time, other cells are recruited from the surrounding tissue to form additional layers on the outer surface of the endothelial tube. The cells that are recruited are called mesenchymal cells. Mesenchymal cells are responsible for the production of connective tissue that holds the blood vessel together and for developing into vascular smooth muscle cells that are responsible for regulating the diameter of the vessel (1) and therefore, blood flow. In a fully developed blood vessel, the endothelial cells make- up the majority of cells in the intimal layer while the mesenchymal cells make-up the majority of cells in the medial and adventitial layers. Within the medial layer of a mature vessel, cells are organized into multiple circular layers of alternating bands of connective tissue and cells. The cell layer is composed of a mixture of mesenchymal cells that have not developed into smooth muscle cells and fully developed smooth muscle cells (2). The assembly and organization of complex tissues is directed in part by a signaling system composed of proteins on the cell surface called adhesion molecules. Adhesion molecules enable cells to recognize each other as well as the composition of the connective tissue in which they reside (3). It was hypothesized that the different cell types that compose the vascular wall possess different adhesion molecules that enable them to recognize each other and through this recognition system, form the complex layered organization of the vascular wall. In other words, the layered organization is an intrinsic property of the cells. If this hypothesis is correct then the different cells that make up the vessel wall, when mixed together, should organize themselves into a layered structure resembling an intact blood vessel. Experiments described below were designed to test this hypothesis.

Derived from text

Anatomy; Muscles; Shear Stress; Cardiovascular System; Blood Flow; Connective Tissue

19990024866 Texas Univ. Health Science Center, Houston, TX USA
Use of NASA Bioreactor in Engineering Tissue for Bone Repair *Final Report*
Duke, Pauline, Texas Univ. Health Science Center, USA; Mar. 31, 1998; 7p; In English
Contract(s)/Grant(s): NCC9-36; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This study was proposed in search for a new alternative for bone replacement or repair. Because the systems commonly used in repair of bony defects form bone by going through a cartilaginous phase, implantation of a piece of cartilage could enhance the healing process by having a more advanced starting point. However, cartilage has seldom been used to replace bone due, in part, to the limitations in conventional culture systems that did not allow production of enough tissue for implants. The NASA-developed bioreactors known as STLV (Slow Turning Lateral Vessel) provide homogeneous distribution of cells, nutrients, and waste products, with less damaging turbulence and shear forces than conventional systems. Cultures under these conditions have higher growth rates viability, and longevity, allowing larger "tissue-like" aggregates to form, thus opening the possibilities of producing enough tissue for implantation, along with the inherent advantages of in vitro manipulations. To assure large numbers of cells and to eliminate the use of timed embryos, we proposed to use an immortalized mouse limb bud cell line as the source of cells.
Derived from text
Bioreactors; Tissues (Biology); Bones; Cartilage; Space Processing; Aerospace Technology Transfer; Bioengineering; Culture Techniques

19990024878 Baylor Coll. of Medicine, Houston, TX USA
Insulin and Glucagon Secretion In Vitro *Final Report*
Rajan, Arun S., Baylor Coll. of Medicine, USA; Mar. 31, 1998; 5p; In English
Contract(s)/Grant(s): NCC9-36; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Long-duration space flight is associated with many physiological abnormalities in astronauts. In particular, altered regulation of the hormones insulin and glucagon may contribute to metabolic disturbances such as increased blood sugar levels, which if persistently elevated result in toxic effects. These changes are also observed in the highly prevalent disease diabetes, which affects 16 million Americans and consumes over $100 billion in annual healthcare costs. by mimicking the microgravity environment of space in the research laboratory using a NASA-developed bioreactor, one can study the physiology of insulin and glucagon secretion and determine if there are alterations in these cellular processes. The original specific objectives of the project included: (1) growing ("cell culture") of pancreatic islet beta and alpha cells that secrete insulin and glucagon respectively, in the NASA bioreactor; (2) examination of the effects of microgravity on insulin and glucagon secretion; and (3) study of molecular mechanisms of insulin and glucagon secretion if altered by microgravity.
Derived from text
Insulin; Cells (Biology); Culture Techniques; Abnormalities; Metabolism; Sugars; Blood; Astronauts

19990024879 Baylor Coll. of Medicine, Houston, TX USA
Development of Telemedicine Capabilities for a Joint U.S-Russian Space Biomedical Center for Training and Research *Final Report*
DeBakey, Michael E., Baylor Coll. of Medicine, USA; Dec. 31, 1998; 7p; In English
Contract(s)/Grant(s): NCC9-36; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

From the perspective of scheduling, some medical consultations can have asynchronous and synchronous components. Consultations frequently involve the compilation of patient data, its analysis, a consultant's report, and a real-time conference between the referring physician and the consultant. The bandwidth of the Internet with Moscow and advances in the hardware and software of personal computing now make possible telemedicine events with store-and-forward components and real-time components. These are hybrid telemedicine and this paper describes such a case.
Author
Telemedicine; Education; Real Time Operation; Conferences; Synchronism

19990024881 Texas Univ., Dept. of Veterinary Sciences, Houston, TX USA
Studies of Cell-Mediated Immunity Against Immune Disorders Using Synthetic Peptides and Rotating Bioreactor System *Final Report*
Sastry, Jagannadha K., Texas Univ., USA; Apr. 30, 1998; 7p; In English
Contract(s)/Grant(s): NCC9-36; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We conducted a series of experiments using mouse immune-precursor cells, and observed that bioreactor culturing results in the loss of antigen-specific cytotoxic T lymphocyte (CTL) function. The reason for the abrogation of CTL function is micro-

gravity conditions in the bioreactor, but not the antigen per se or its MHC restriction. Similarly, we observed that allostimulation of human PBMC in the bioreactor, but not in the T flask, resulted in the blunting of both allo-CTL function and the NK activity, indicating that the microgravity-associated functional defects are not unique to the mouse system. These results provide further confirmation to the microgravity-associated immune dysfunction, and constitute ground-based confirmatory data for those related to space-travel.
Derived from text
Immunity; Peptides; Bioreactors; Aerospace Medicine; Biological Effects; Bioastronautics; Lymphocytes

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19980023288 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Tests of Cognitive, Perceptual and Sustained Attention Functions in Hot Environments
Patterson, Mark J., Defence Science and Technology Organisation, Australia; Nigel, A. S., Defence Science and Technology Organisation, Australia; Amos, Taylor, Defence Science and Technology Organisation, Australia; Amos, Denys, Defence Science and Technology Organisation, Australia; Sep. 1997; 25p; In English
Report No.(s): DSTO-TR-0650; DODA-AR-010-503; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia); Hardcopy, Microfiche

The report reviews the utility of various tests of cognitive function during human performance in hot conditions. The evidence that the thermal environment does impact upon cognitive, perceptual or motor functions is not unequivocal. The lack of consistency in the quantification of ambient conditions, body core and skin temperatures restricts the value of many investigations. Differences in task duration and complexity may lead to disputable conclusions being drawn. Overall, heat stress does appear to impact upon some forms of cognitive and motor performance. Guidelines and procedures for selecting appropriate cognitive, perceptual and sustained attention tests are discussed. Tests suitable for determination of the effects of heat on psychological performance are recommended. Experimental conditions detailing the degree of thermal strain appropriate for cognitive function tests in the heat are described.
Author
Cognition; Perception; Human Performance; High Temperature Environments; Mental Performance

19980023318 Institute for Human Factors TNO, Soesterberg, Netherlands
Mental Load is not Affected in a Moving Environment: Final Report. Mentale belasting wordt niet beinvloed in een bewegende omgeving
Wertheim, A. H., Institute for Human Factors TNO, Netherlands; Dec. 11, 1998; 18p; In English
Contract(s)/Grant(s): A98/KM/332; TNO Proj. 789.3
Report No.(s): TD98-0283; TM-98-A068; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, P.O. Box 23, 3769 ZG Soesterberg, The Netherlands); Hardcopy, Microfiche

Earlier findings suggest that cognitive skills are not affected in a moving environment. In the present paper an experiment is reported in which the question was investigated whether during cognitive activity in a moving environment (ship motion simulator), not task performance, but mental work load, is affected as compared to a situation where the task is carried out in a stationary environment. However, the results revealed no evidence for any effect on either task performance or mental work load.
Author
Experimentation; Workloads (Psychophysiology); Motion Simulators; Human Performance; Environment Simulators

Includes human engineering, biotechnology, and space suits and protective clothing. For related information see also 16 Space Transportation.

19990021031 Alaska Univ., Dept. of Aviation Technology, Anchorage, AK USA
F18 Life Support: APECS and EDOX Cockpit Integration
Herrick, Paul, Alaska Univ., USA; Oct. 1998; 3p; In English. See also 19990021025; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Two systems are currently being integrated into the F18 Hornet support aircraft at NASA Dryden Flight Research Center (DFRC). The first system is the Aircrew Personal Environmental Control System (APECS). The system is designed to increase aircrew performance by combating heat stress in the cockpit. The second system is the Extended Duration Oxygen System (EDOX). This system will provide additional redundancy and oxygen system duration to the F18 without extensive modification to the current system.
Author
Life Support Systems; F-18 Aircraft; Environmental Control

19990021122 Lamont-Doherty Geological Observatory, Palisades, NY USA
Summer Research Internships at Biosphere 2 Center: *Progress Report*
Broecker, Wallace S., Lamont-Doherty Geological Observatory, USA; Colodner, Debra, Biosphere 2 Center, USA; Griffin, Kevin, Lamont-Doherty Geological Observatory, USA; 1997; 125p; In English. See also 19990021123 through 19990021128
Contracts/Grants(s): NAG5-6294
Report No.(s): NASA/CR-97-207804; NAS 1.26:207804; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Through the support of NASA's Mission to Planet Earth, Biosphere 2 Center hosted 11 research interns for 6 to 8 weeks each during the summer of 1997. In addition, we were able to offer scholarships to 14 students for Columbia University summer field courses. These two types of programs engaged students in much of the range of activity of practicing Earth Scientists, with an emphasis on the collection and analysis of data in both the field and the laboratory. Research interns and students in the field courses also played an important part in the design and evolution of their research projects. In addition to laboratory and field research, students participated in weekly research seminars by resident and visiting scientists. Research interns were exposed to the geology and ecology of the region via short field trips to the Arizona Sonora Desert Museum, Mount Lemmon, Aravaipa Canyon and the Gulf of California, while field course students were exposed to laboratory-based research via intern-led hands-on demonstrations of their work. All students made oral and written presentations of their work during the summer, and two of the research interns have applied to present their results at the National Conference on Undergraduate Research in Maryland in April, 1998.
Derived from text
Mission to Planet Earth; Students; Geology; Biosphere; Data Acquisition; Ecology

19990021123 Harvard Univ., Dept. of Environmental Engineering, Cambridge, MA USA
Methane Production and Transport within the Marsh Biome of Biosphere 2
Molnar, Jennifer, Harvard Univ., USA; Goodridge, Kelven, Morehouse Coll., USA; Summer Research Internships at Biosphere 2 Center, 1997; 12p; In English. See also 19990021122; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

In recent decades, the concentration of methane in the earth's atmosphere increased 1-2% annually. It's rate of increases, combined with methane's effectiveness as a greenhouse gas, has led to an intensive research effort to determine the sources and sinks of the gas in the environment. Biosphere 2 offers a unique opportunity to contribute to the effort because it lacks a major photochemical sink present in the Earth's atmosphere. Researchers can therefore concentrate on biological processes involved in methane cycles. Wetlands are a large source of atmospheric methane, due to anoxic conditions in the sediments and the abundance of organic materials. In order to determine if these conditions in Biosphere 2 also promote methane production, this study looked for the fluxes of methane and methods of transport of the gas from from the water and sediments to the atmosphere in the Marsh Biome. Fluxes of methane from the sediments and waters were measured using static chambers, peepers, and leaf bags. Fluxes and vertical profiles of methane in the sediments show that substantial amounts of methane are being produced in the marsh and are being transported into the Biosphere 2 environment.
Author
Methane; Photochemical Reactions; Earth Atmosphere; Gas Transport; Air Pollution; Atmospheric Composition

19990021124 Harvard Univ., Cambridge, MA USA
Biosphere 2's Marsh Biome
Molnar, Jennifer, Harvard Univ., USA; Goodridge, Kelven, Morehouse Coll., USA; 1997; 13p; In English; See also 19990021122; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The Marsh Biome, which was modeled after the mangroves and marshes of southwest Florida, has an area of 441.2 sq m separated into three hydrologically independent sections: the Freshwater, Oligohaline and Salt Marshes. The divisions are made based on their salinity (approximately 0, 4, and 34 ppt, respectively), but they also contain different biological communities. The Freshwater and Oligohaline Marshes are mostly filled with various grasses and several trees, while the Salt Marsh houses regions of red, black, and white mangroves (Rhizophora mangle, Avicennia germinans, and Laguncularia racemosa respectively). Overall, there are an estimated 80 species of plants within the biome. Water in the Salt Marsh follows a meandering stream from the algal turf scrubbers (apparatuses that clean the water of its nutrients and heavy metals while increasing dissolved oxygen levels) which have an outlet in the Salt Marsh section near sites 4 and 5 to the Fringing Red Mangrove section. The sections of the Salt Marsh are separated by walls of concrete with openings to allow the stream to flow through. Throughout this study, conducted through the months of June and July, many conditions within the biome remained fairly constant. The temperature was within a degree or two of 25 C, mostly depending on whether the sample site was in direct sunlight or shaded. The pH throughout the Salt Marsh was 8.0 +/- 0.2, and the lower salinity waters only dropped below this soon after rains. The water rdepth and dissolved oxygen varied, however, between sites.
Author
Marshlands; Biosphere; Grasses; Dissolved Gases; Fresh Water; Ecosystems

19990021126 Oberlin Coll., OH USA
Light, temperature, and leaf nitrogen distribution in the tropical rain forest of Biosphere 2 and their importance in the mathematical models for global environmental changes
Tohda, Motofumi, Oberlin Coll., USA; Summer Research Internships at Biosphere 2 Center; 1997; 23p; In English; See also 19990021122; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

As the environmental changes occur throughout the world in rapid rate, we need to have further understandings for our planet. Since the ecosystems are so complex, it is almost impossible for us to integrate every factor. However, mathematical models are powerful tools which can be used to simulate those ecosystems with limited data. In this project, I collected light intensity, canopy leaf temperature and Air Handler (AHU) temperature, and nitrogen concentration in the leaves for different profiles in the rainforest mesocosm. These data will later be put into mathematical models such as "big-leaf" and "sun/shade" models to determine how these factors will affect CO2 exchange in the rainforest. As rainforests are diminishing from our planet and their existence is very important for all living things on earth, it is necessary for us to learn more about the unique system of rainforests and how we can co-exist rather than destroy.
Author
Mathematical Models; Rain Forests; Ecosystems; Gas Exchange; Carbon Dioxide; Biosphere; Nitrogen

19990021127 Massachusetts Inst. of Tech., Dept. of Environmental Engineering, Cambridge, MA USA
The effects of atmospheric (CO2) on carbon isotope fractionation and magnesium incorporation into biogenic marine calcite
Vieira, Veronica, Massachusetts Inst. of Tech., USA; Summer Research Internships at Biosphere 2 Center; 1997; 15p; In English; See also 19990021122; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The influences of atmospheric carbon dioxide on the fractionation of carbon isotopes and the magnesium incorporation into biogenic marine calcite were investigated using samples of the calcareous alga Amphiroa and benthic foraminifer Sorites grown in the Biosphere 2 Ocean system under variable atmospheric CO2 concentrations (approximately 300 to 1200 ppm). Carbon isotope fractionation was studied in both the organic matter and the skeletal carbonate. Magnesium analysis was to be performed on the carbonate removed during decalcification. These data have not been collected due to technical problems. Carbon isotope data from Amphiroa yields a linear relation between [CO2] and Delta sup 13C sub Corg values suggesting that the fractionation of carbon isotopes during photosynthesis is positively correlated with atmospheric [CO2]. [CO2] and Delta sup 13C sub Corg values for Sorites produce a relation that is best described by a hyperbolic function where Delta sup 13C sub Corg values increase between 300 and 700 ppm and decrease from 700 to 1200 ppm. Further investigation of this relation and Sorites physiology is needed.
Author
Carbon Dioxide Concentration; Calcification; Atmospheric Composition; Photosynthesis; Magnesium; Carbonates; Fractionation

19990021269 Biosphere 2 Center, Oracle, AZ USA
Biosphere 2 Educational Models
Summer Research Internships at Biosphere 2 Center, 1998, 9p, In English. See also 19990021265, No Copyright, Avail: CASI, A02, Hardcopy; A03, Microfiche

One important tool you might use is the computer model. Models help us understand complex systems and allow us to test how a system reacts to changes that we cannot (or should not) make to the real environment. A model is a simplification of a real system, but a simplification that captures the essence of one or more relationships. Biosphere 2 offers a unique opportunity for modeling in that the boundaries of our models are boundaries in the real world: if you model a Brazilian rainforest you will need to set artificial barriers around the system, but with the Biosphere 2 rainforest there are real boundaries isolating it from the rest of the world. The material closure of Biosphere 2 allows you to easily test your model against real data to see whether your model captures the essence of the real system.
Author
Computerized Simulation; Models; Complex Systems

19990021698 Institute for Human Factors TNO, Soesterberg, Netherlands
Sound Attention and Speech Intelligibility Using Double Hearing Protection in the Chinook Helicopter. *Final Report Geluidverzwakking en Spraakverstaanbaarheid bij Gebruik van Dubbele Gehoorbescherming in de Chinook Helikopter*
vanWijngaarden, S. J., Institute for Human Factors TNO, Netherlands; Kriekaard, J. J., Institute for Human Factors TNO, Netherlands; Dec. 08, 1998; In English
Contract(s)/Grant(s): A98/Klu/351; TNO Proj. 786.4
Report No.(s): TNO-TM-98-A065; TD98-0277; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 De Soesterberg, The Netherlands), Hardcopy, Microfiche

On behalf of the Royal Netherlands Airforce (DMKLu/MSMK; DOPKLu/STAORE), speech intelligibility and sound attenuation were investigated, for crew members in the CH-47D Chinook helicopter using double hearing protection (helmet and earplugs). Subjective measuring methods were used; 16 subjects, all Chinook crew members, participated in the experiments. by using earplugs it is possible to extend maximum exposure times to 8 hours daily. Earplugs giving equal attenuation for all frequencies were tested; earplugs giving 15 dB of attenuation for all octave bands are preferred over heavier (25 dB) earplugs, since lighter earplugs give better speech intelligibility. This result was found for the current standard helmet (SPH-5 [Peltor]) as well as for the future standard helmet (HGU-56/P). The attenuation of either of these helmets with both earplug types gives approximately the same attenuation curve, which appears to be the a maximum. Application of earplugs makes it desirable to modify the intercommunication system to yield higher earphone levels, although this is not strictly necessary when using the 15 dB type of earplug.
Author
Acoustic Attenuation; Sound Amplification; Hearing; Protection; Intelligibility

19990023296 Norwegian Defence Research Establishment, Kjeller, Norway
Image-Based Estimation of Parameters in a Human Model
Njastad, Johnny, Norwegian Defence Research Establishment, Norway; Grimaker, Stein, Norwegian Defence Research Establishment, Norway; Storhaug, Geir Atle, Norwegian Defence Research Establishment, Norway; Sep. 21, 1998; 70p; In English
Contract(s)/Grant(s): Proj. FFIVM/660/130
Report No.(s): FFI/RAPPORT-98/04479; ISBN 82-464-0294-3; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this report we describe a method for estimating the parameters of a 3D human model. Most of the algorithm works on a segmented image in which moving objects have been separated from the (semi)stationary background. The estimation process is divided into two steps: In the initial step, we first locate the torso based on an assumption that the torso moves smoothly through the scene and that it is a convex object. Then, we perform a search for the limbs. The idea behind this search procedure is that the distance from a limb's suspension point to the boundary of the moving object is large in the direction of the limb. In the second step, we improve the initial estimate by minimizing the overall distance from the contour of the model to the boundary of the extracted moving object.
Author
Image Analysis; Three Dimensional Models; Algorithms; Estimating

19990023315 Institute for Human Factors TNO, Soesterberg, Netherlands
On the Design of Tactile Displays *Interim Report Het ontwerpen van tactiele displays*
vanErp, J. B. F., Institute for Human Factors TNO, Netherlands; vandenDobbelsteen J. J., Institute for Human Factors TNO, Netherlands; Sep. 25, 1998; 43p; In English
Contract(s)/Grant(s): B97-031; TNO Proj. 788.1
Report No.(s): TD98-0266; TM-98-B012; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, P.O. Box 23, 3769 ZG Soesterberg, The Netherlands); Hardcopy; Microfiche

In some situations, reasons may be present to use the tactile sense as information presentation channel. These reasons are present when the characteristics of the presented information resembles the tactile sense (e.g. surface information of objects in virtual environments), when the surroundings lowers the effectiveness of other modalities (e.g. auditive information in noisy places), or when the observer is less able to perceive information from other modalities (e.g. visual information when the visual channel has less spare capacity). In these situations, tactile displays may be preferred above auditive and visual displays. Despite the knowledge on the tactile modality and the fact that experiments with tactile displays are conducted since the 60's, no set with design criteria is available. Therefore, the present report described the considerations which may be important in designing tactile displays. These considerations are based on the fundamental physiological and psychophysical knowledge and the lessons learned from investigations with tactile displays. Furthermore, an overview of actuator principle and actuator types is given. An overview of points of consideration is given in the Appendix. In the discussion, two promising application areas are defined: a tracking display in steering and control tasks, and a situation awareness display in orientation tasks.
Author
Design Analysis; Visual Perception; Actuators

19990024905 Beijing Univ. of Aeronautics and Astronautics, Dept. of Flight Vehicle Design and Applied Mechanics, Beijing, China
Dynamic model of human spine to impact loading
Jinzhi, Zhang, Beijing Univ. of Aeronautics and Astronautics, China; Dongming, Zhu, Beijing Univ. of Aeronautics and Astronautics, China; Hanchao, Mai, Beijing Univ. of Aeronautics and Astronautics, China; Zhizhong, Huang, Beijing Univ. of Aeronautics and Astronautics, China; Journal of Beijing University of Aeronautics and Astronautics, February 1998; ISSN 1001-5965; Volume 24, No. 1, pp. 43-45; In Chinese; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Establishing a human spine dynamic model is a significant event to study spine injured biomechanics of pilot's ejective injury, parachute opening, landing and study the endurance to impact loading on human spine. In this paper, the Huston's method of Kane's equations is developed so that it can be applied to the multi-body-system including translation between the bodies. The dynamic model of human spine is provided based on these theories, while the big movement of the spine is considered. The deformation of vertebrae is far smaller compared with the intervertebrae disc, so the spine is considered into multi-body-system including rigid bodies (vertebrae) and the flexible bodies (intervertebrae disc). The computer solution corresponds with the results of the large scale human impact test. The rigid coefficient factors and the damping factor of intervertebrae joints are obtained.
Author
Vertebrae; Spine; Impact Loads; Dynamic Models; Biodynamics; Impact Tests

19990025118 Michigan Univ., Kresge Hearing Research Inst., Ann Arbor, MI USA
Virtual Auditory Space: Individual Differences *Final Report*
Middlebrooks, J. C.; Mar. 1998; 4p; In English
Report No.(s): AD-A358413; N000014-96-1-5006; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Head related transfer functions (HRTFs) capture the direction dependent filter characteristics of the external ears. When a sound is filtered by HRTFs measured from a listener's own ears and played over headphones, the listener hears a virtual source that is well localized in space. When sounds were filtered by other listeners' HRTFs, listeners showed fairly accurate localization in the lateral dimension but showed conspicuous vertical and front/back errors. We examined differences among HRTFs measured from 45 listeners. We quantified differences by subtracting HRTFs between listeners for corresponding locations, then computing the variance of the resulting difference spectra across 393 locations. Interlistener differences could be reduced by shifting HRTFs scaling in frequency. Optimal scalars reduced variances by an average of 20.2% across all pairs of listeners and by more than 50% in 9.5% of listener pairs. The optimal scalar for any pair of listeners correlated highly with the relative sizes of certain physical dimensions. When HRTFs were shifted optimally then used in virtual localization trials, all measures of virtual localization perfor-

mance tended to improve. In the majority of cases, the performance penalty for use of HRTFs from another listener was reduced by more than half.
DTIC
Frequencies; Subtraction; Transfer Functions

19990025128 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Experimental Developmentation of the Viscoelastic Properties of the Human Fingerpad
Birch, Amanda S.; Jun. 1998; 98p; In English
Report No.(s): AD-A358536; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Understanding the human tactile system is the motivation for this research. The linear viscoelastic mechanical properties of the human fingerpad describe the stress-strain relationship within the fingerpad for any stimulus geometry and any time history of applied forces or displacements. The stress-strain relationships within the fingerpad tissue govern the stimuli to the mechanoreceptors which are the source of all tactile information to the brain. A device referred to as the tactile stimulator was designed and is presented in this work. The tactile stimulator is a versatile device that can provide a variety of dynamic stimuli to any material and measure the displacement and force responses. The stimuli can vary with time and with indentor shape. The device is currently configured to allow normal or tangential displacement- controlled stimuli.
DTIC
Displacement; Mechanical Properties; Mechanoreceptors; Stress-Strain Relationships; Viscoelasticity

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